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and Capt. Shepley's "Sun-birds," forming one of the series of illustrated ornithological monographs prepared by different members of the British Ornithologists' Union. A companion volume, by Mr. Dresser, on the "Bee-eaters," is in a forward state, and similar works are already projected.——Another subarctic mammal, *Spermophilus rufescens*, which lives in the Orenburg steppes of Asia, has been found fossil in the loess and caves of Germany, as reported by Blasius in the *Zoöl. Anzeiger.*——C. J. Maynard states that the ivory-billed woodpecker (*Campephilus principalis*) which in Audobon's time inhabited the Atlantic coast as far north as Maryland, was common in the lower parts of the Carolinas, in Georgia, Alabama, Louisiana and Mississippi, and occurred as far north as the mouth of the Ohio, and westward of the Missouri throughout the forests along the rivers to the base of the Rocky mountains; is now, unless it lingers in the heavily wooded parts of the state of Mississippi, confined to a small belt of "hummock" or "cypress" timber land, about a hundred miles long by fifty in width, in the northern part of Florida, and is rare even there.

PHYSIOLOGY.[1]

THE ELECTROMOTIVE PROPERTIES OF THE LEAF OF DIONÆA.—Professor G. B. Sanderson (Trans. Roy. Soc., Part I, 1882), gives an account of his researches on the electrical relations of the different parts of the leaf of Dionæa in its resting and in its excited condition, together with a résumé of similar work of other investigators.

The leaf of Dionæa contains two or three layers of parenchymatous cells whose protoplasm has great attraction for water. The leaf owes its expanded condition while at rest to the turgidity of the parenchyma cells whose protoplasm contains much imbibed water. But when the leaf is excited, as by a touch, the protoplasm of the upper layers of parenchyma cells in the laminæ and midrib squeezes out water, and the leaf closes up, owing to the strain exerted by the still swollen under layer of cells.

With the aid of the galvanometer, Professor Sanderson finds that different points upon the surface of the leaf are usually, but probably accidentally, in different electrical conditions; but after one or more excitations, the under surface of the leaf becomes always more positive than before. But if the galvanometric observation be made while the leaf is stimulated mechanically or electrically, the under surface of the leaf, as compared with the upper, becomes to a marked degree more negative than before. This negative change begins about one-twentieth of a second after the application of the stimulus, and ceases at about the middle of the first second; that is, in that time the under surface of the leaf has returned to its former electrical condition. In the succeeding second the electrical relations of the two surfaces of the leaf are reversed, the lower surface becoming now positive to the upper.

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[1] This department is edited by Professor HENRY SEWALL, of Ann Arbor, Michigan.

"A voltaic current directed from the upper to the under surface, which is too weak to invoke an excitatory response, produces an increase of the positivity of the under surface, limited to the part of the lobe through which the current passes, which lasts several seconds after the current is broken. * * * When a leaf is subjected to series of inadequate induction shocks at short intervals (*e. g.*, one-twentieth of a second), the response may occur after a greater or less number of excitations, according to the temperature at which the experiment is made and the strength of the current. * * * In a series of mechanical excitations, each of which is just adequate to produce an electrical response, those which occur earliest are followed by no change of form. Of the later members of the series each produces a measureable movement, the extent of which becomes greater each time that the excitation is repeated until eventually the leaf closes."

The first electrical change which the leaf of Dionæa undergoes after excitation (the increased negativity of the under surface of the leaf) is probably a physiological change which is the outcome of some functional explosion in the cell protoplasm, and is closely analogous to the "action current" which is a sign of functional excitement in an animal nerve or muscle. The second electrical condition, which is more slowly brought about and is more lasting, that in which the under surface of the leaf becomes positive to the upper, is probably due simply to the transference of water from the cells to the intercellular spaces.

THE INFLUENCES WHICH DETERMINE SEX IN THE EMBRYO.—Professor E. Pflüger publishes at length an account of experiments, performed with the greatest care, with the object of throwing light upon some of the most prominent of the obscure problems of the physiology of generation (Pflüger's Archiv., Bd. XXIX, Heft 1 and 2). Professor Pflüger made use of frogs in his experiments; many hundreds of the creatures were obtained from various neighborhoods, and were maintained while under observation under conditions made as nearly normal as possible.

The first question attacked is: Does the concentration of the spermatic fluid of the male influence the sex of the offspring? Much care is necessary in handling frogs' eggs, for they are exceedingly susceptible of mechanical injury. The pair of frogs are parted during the sexual embrace, and therefore at a time when the products of the generative organs are presumably ripe, the animals are killed and the spermatic sacs of the males are emptied into a watch crystal. A second watch crystal filled with water is impregnated with spermatazoa by dipping into it the tips of the fine pair of scissors which has just been used to cut open the spermatic sacs and has, therefore, some of their contents clinging to it. The dilute spermatic fluid of the second watch crystal was often further diluted from ten to twenty volumes and from these new mixtures fresh quantities of water in watch crystals were impregnated by the transference of a film of fluid clinging to the scissors' tips. Into these watch crystals filled with the fluid of a single male in different states of concentration, there were allowed to glide some of the eggs of the female taken from the right uterus. The outcome of the experiments established two facts: First, the fertilizing power of the spermatic fluid was not diminished by dilution, all the ova were fertilized in each observation; second, dilution of the male fluid had no effect on the sex of the frogs which came to maturity after the artificial fertilization.

In young frogs there are three varieties of sexual character, male, female and hermaphrodite. The hermaphrodites become finally either male or female, but in their earlier stages they have the sexual organs of the female only; in those which are finally to become males, the testicles gradually develop round the ovaries and the latter are resorbed. This apparent numerical predominance of the female in early stages of the fuller formed frog has led some investigators astray.

The author finds that no batrachian egg segments without previous fertilization.

The fertilizing power of the male fluid diminishes greatly and progressively after the season for sexual union.

It is impossible to produce offspring by the union of the male and female products of two different batrachian species, though segmentation of the egg, frequently of abnormal type, may be started by this artificial union.

THE PRODUCTION OF DISEASE BY BACTERIAL ORGANISMS.—One of the most remarkable chapters in the history of biological science, when it is written, must be that which treats of the development of our knowledge in the interval included between the early days of Liebig and the present time, concerning the nature of the organized ferments. The rich rewards of discovery which invited the investigator toward the unstudied hosts of bacteria life, and the apparent ease with which definite results were experimentally obtained, has tempted scores of observers, some, perhaps, little qualified for the task undertaken, to enter upon the investigation of a subject which has proved itself one of the most difficult and complex in the whole range of biology. We find, consequently, even in a single aspect of bacteria life, its relation to infectious diseases, the most contradictory opinions.

Ever and anon is announced a brilliant discovery concerning the causal relation of bacteria to some malignant disease, apparently opening a way to the rational treatment or extermination of the distemper; but after a time counter experiments performed after other methods throw doubt upon or disprove the conclusions before considered so logical, until the inexpert looker-on is inclined to despair of ever seeing certainty finally arrived at.

Some investigators in our own country, well fitted by talent and education to enter this field of research, have arrayed themselves in the opposition against views concerning the action of bacteria in certain diseases, which have found among other workers general acceptance.

The *Bacillus tuberculosis* of Koch has gained a world-wide reputation. But Dr. Formad (*Phil. Med. Times*, Nov., 1883), has come to the conclusion that the Bacillus is not the cause of the disease, but is found in abundance in tubercular tissue simply because it finds there its most agreeable food. Formad regards tuberculosis as primarily due to an anatomical defect, namely, a superabundant development of connective tissue and a consequent narrowing of the lymph spaces of the tissue, thus making the latter much more subject to pathological change than is normally the case. The artificial production of tuberculosis brought about by Koch through the injection into living animals of matter infected with Bacilli, Formad does not regard as of great weight, for it was found during the researches on diphtheria, carried out by Drs. Wood and Formad, that the placing of an innocuous object, as a piece of glass, under the skin of a rabbit produced death of the animal by tuberculosis.

It has been generally suspected or believed that a minute organism occurring in the pus obtained from patients suffering from gonorrhœa, is the cause of that disease; but the careful and competent observations of Dr. Sternberg make that hypothesis very questionable (*Med. News*, Jan. 20, 1883). The author writes:

"The micrococcus which I have found in a certain number of pus cells in every specimen of gonorrhœal pus examined by me, is an accidental parasite which has nothing to do with the special virulence of this fluid * * * and a careful search with a first-class objective and by use of staining reagents, has not revealed the presence in this fluid of any other micro-organism than this micrococcus."

The author found that the lower animals could not be innoculated with the disease by the injection of pus into them. By means of artificial cultivation in culture fluids, Sternberg was enabled to produce successive generations of the micrococcus in question, and found that the parasite thus isolated did not produce gonorrhæa when the fluid containing it was injected into the urethra of human patients. Sternberg is led to conclusions supported by Cohn, Koch and others: "My researches show that differences, morphological and physiological, exist among these lowly plants, which make it possible to establish species having characters quite as well defined as have many plants much higher in the scale."

Dr. Schmidt is heretical upon the whole subject of the occurrence of bacteria in certain pathological tissues (*Chicago Med. Jl.*, Dec.. 1882). Schmidt believes that the forms described as *Bacillus tuberculosis* are nothing more than slender colored crystals of fat which have been produced by the reagents which it is necessary to use in preparing the tissue sections for examination. It is very doubtful, however, whether this view will ever receive worthy confirmation.

THE ORIGIN AND DESTINY OF FAT CELLS.—Some light is thrown upon the problem of the origin and destiny of fat-cells by the observations of Mr. S. H. Gage upon those of Necturus. In the subcutaneous connective tissue of this creature the microscope revealed the presence of fat-cells in all stages of growth; large branched cells with one or more fat drops; cells containing one or two small fat drops and a large one; and some large unbranched cells entirely gorged with fat. The pigment cells were sometimes partly gorged with fat, and some small round or oval cells also contained fat.

Thus it would appear that, as maintained by Virchow, Frey, Klein and others, fixed or branched connective tissue corpuscles may become modified into fat-cells, and also, as asserted by Czajewicz, Rollett and others, migratory corpuscles may become quiescent and turn into reservoirs of fat. After a Necturus has been kept upon sparse diet for some time, the adipose tissue shows but few gorged cells, many trasitional forms, and a greater proportion of branched cells without fat, thus proving that the fat-cell is simply a store of food, and that, when their store is used, the cells revert to their primitive condition of branched or unbranched cells.

RECENT EMBRYOLOGICAL PAPERS ON VERTEBRATES.—The development of the middle germ-layer of vertebrates is being discussed by O. Hertwig in the *Jenaischer Zeitschrift*, with numerous plates containing views of this layer in the different classes. In the same journal J. Walther describes the development of the covering-bones of the skull of the pike (*Esox lucius*). In his paper on the early development of *Lacerta muralis*, W. F. R. Weldon treats chiefly of the mode of formation of the germinal layers, and the early development of the kidney.

EMBRYOLOGY OF THE SILK-WORM.—This has been studied by S. Salvatico, who finds that the amnion appears as a membrane with large nucleated cells like those of the serous membrane, but without pigment. The malphigian vessels originate in the ectoderm. He did not note the early appearance of the rudiments of the genital glands, which was observed by Balbiani in *Tinea crinella*.

DEVELOPMENT OF BITHYNIA, A FRESH-WATER PULMONATE.—After discussing the origin of the larval and adult organs, P. B. Sarasin (Arbeiten Zool. Zoot. Institut zu Warzburg, VI, 1882) claims that all the organs are formed either directly or indirectly from it; the mesodermal elements do not arise at any definite and single point, and there is no evidence of any cleavage in it, and still less of the formation of a true cœlom. As the endoderm, so-called, does not give rise to the enteron, its homology with the similarly named layer in the chick is to be doubted.

EARLY DEVELOPMENT OF THE SALPÆ.—F. Todaro in his second preliminary paper, published in the Italian Biological Archives, states that he has observed the entrance of a single zoösperm into the egg, its conversion into a male pronucleus, and its fusion with the female pronucleus to form the segmentation-nucleus, while the yolk is derived from the epithelial cells of the ovarian sac. The origin of the embryos of the solitary and compound Salpæ is also described.—*Journal Royal Microscopical Society, Feb., 1883.*

PSYCHOLOGY.

ANIMAL DOCTORS.—In a recent communication to the Biological Society, M. G. Delaunay observed that medicine, as practiced by animals, is thoroughly empirical; but the same may be said of that practiced by inferior human races, or, in other words, by the majority of the human species. Animals instinctively choose such food as is best suited to them. A large number of animals wash themselves and bathe, as elephants, stags, birds and ants. M. Delaunay lays down as a general rule that there is not any species of animal which voluntarily runs the risk of inhaling emanations arising from their own excrement. Some animals defecate far from their habitations; others bury their excrement; others carry to a distance the excrement of their young. In this respect they show more foresight than man, who retains for years excrement in stationary cesspools, thus originating epidemics. If we turn our attention to the question of reproduction, we shall see that all mammals suckle their young, keep them clean, wean them at the proper time and educate them; but these maternal instincts are frequently rudimentary in women of civilized nations. In fact, man may take a lesson in hygiene from the lower animals. Animals get rid of their parasites by using dust, mud, clay, &c. Those suffering from fever restrict their diet, keep quiet, seek darkness and airy places, drink water and sometimes even plunge into it. When a dog has lost its appetite it eats that species of grass known as dog's grass (*chiendent*), which acts as an emetic and purgative. Cats also eat grass. Sheep and cows, when ill, seek out certain herbs. When dogs are constipated they eat fatty substances, such as oil and butter, with avidity, until they are purged. The same thing is observed in horses. An animal suffering from chronic rheumatism always keeps as far as possible in the sun. The warrior ants have regularly organized ambulances. Latreille cut the antennæ of an ant, and other ants came and covered the